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(54) Ultraviolet radiation device

(57) A device for the ultraviolet irradiation of a person comprises an ultraviolet radiation generator having a plurality of elongate, parallel ultraviolet radiation lamps (2, 3) arranged side-by-side; a filter (5) to filter out UVC radiation and at least the shorter wavelength UVB radiation; and a corresponding plurality of trough shaped reflectors (6, 7). Each reflector surrounds a respective one of the lamps, and the outermost reflectors each have an outer sidewall (18, 19) which extends forwards beyond the remaining reflector sidewalls (16, 17) to provide a space (26), free from obstruction, in front of the radiation generator.

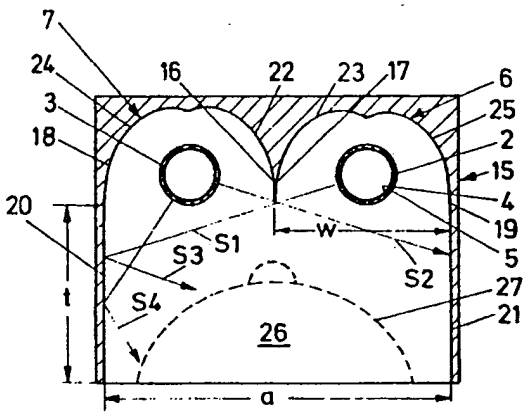

Fig.2

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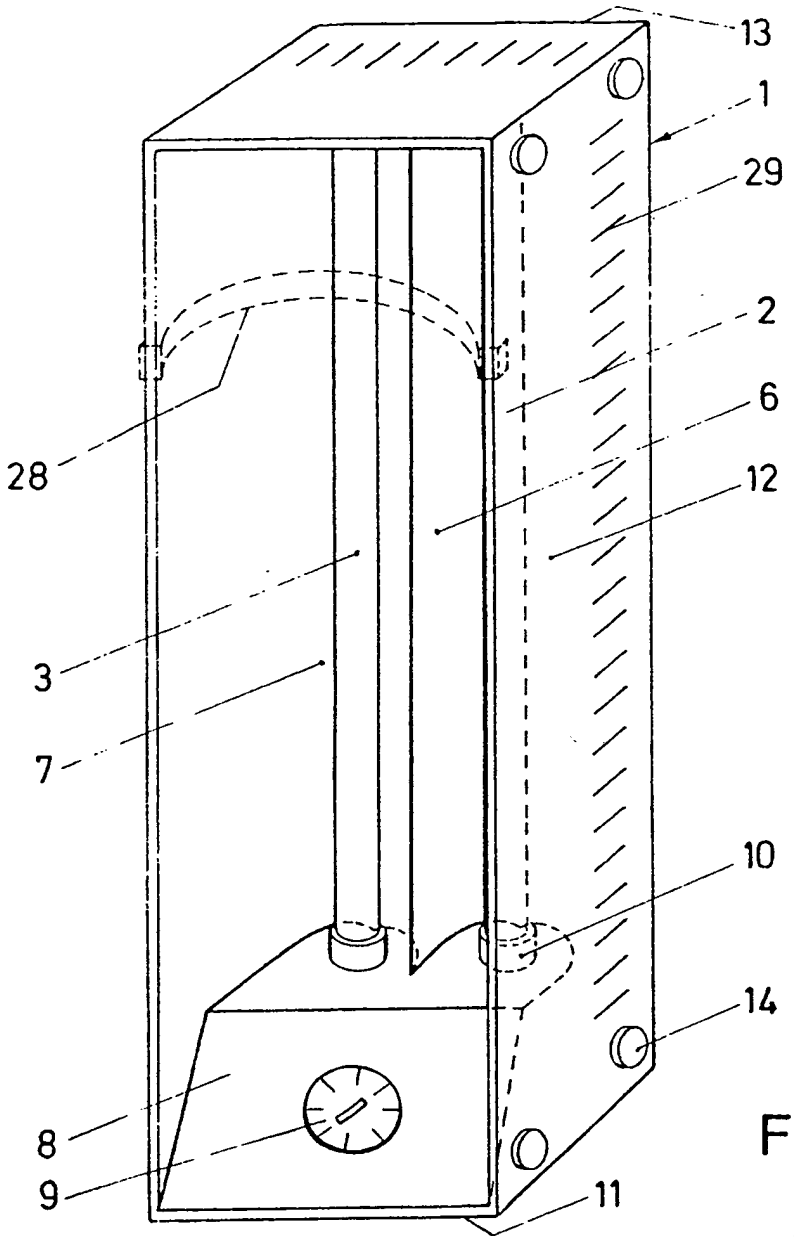

Fig.1

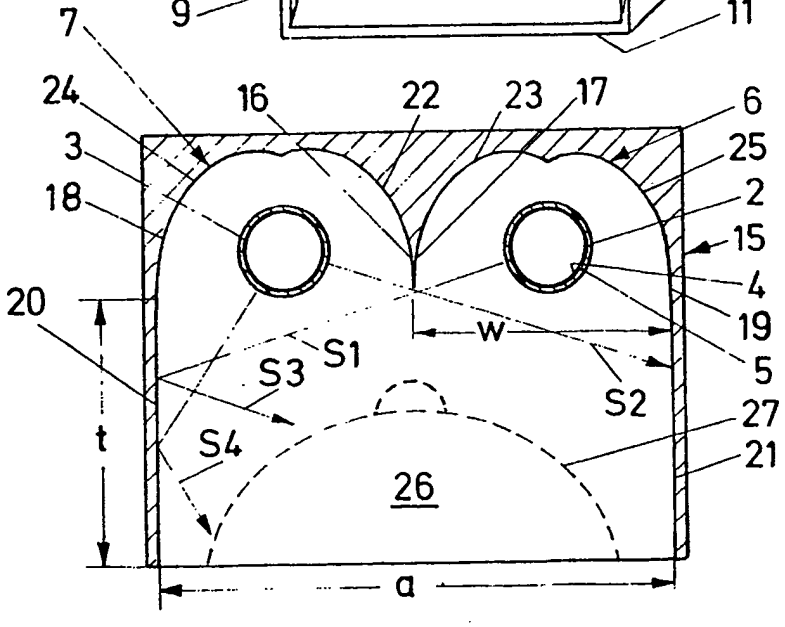

Fig.2

SPECIFICATION

Ultraviolet radiation device

The invention relates to a device for the ultraviolet irradiation of a person, in particular for medical or cosmetic purposes.

A device of this kind is known in which five to twenty mercury vacuum fluorescent tubes are arranged in parallel side by side and are each provided with a trough-shaped reflector such that a largely uniform field of high density radiation in the UVA range and where necessary in a restricted portion of the UVB range is produced at a radiation outlet of the device or at a position a little outside it. A device of that kind is very well suited to the irradiation of fairly large portions of the body or of the whole body.

It is frequently desirable, however to irradiate only small portions of the body, e.g., the face or one part of the arm, if it be that only a face tan is desired or that a skin infection like psoriasis must be treated. For such purposes the known apparatus is too elaborate, the unused radiation is considerable, and, if the part of the body to be irradiated is well rounded, a multiple irradiation must frequently be performed from different sides.

In accordance with the present invention, a device for the ultraviolet irradiation of a person comprises an ultraviolet radiation generator having a plurality of elongate, parallel, ultraviolet radiation lamps arranged side-by-side; a filter to filter out UVC radiation and at least the shorter wavelength UVB radiation; and a corresponding plurality of trough-shaped reflectors, each of which surrounds a respective one of the lamps, the outermost reflectors each having an outer sidewall which extends forwards beyond the remaining reflector sidewalls to provide a space, free from obstruction, in front of the radiation generator.

Thus the invention provides a radiation device which is suited to the treatment of smaller parts of the body like the face, arms or legs and demands minmum outlay from the structural aspect, in energy and in treatment time.

Preferably, the device further comprises a housing which has substantially the shape of a right parallel piped, the front of which forms a radiation outlet, and wherein the housing may stand on a bottom face, to which one end of each of the lamps is fitted, or on its rear face, or on a sideface.

Because of the small number of radiation lamps required the structural cost of this apparatus is small. The part of the body to be treated may be placed at least partially in the free space between the extended sidewalls of the outermost reflectors so that the losses through unused radiation are small. Because of reflection from the extended sidewalls, the radiation is thrown upon the portion of the body to be irradiated not only from the front but also from the side. Thus radiation falls on a relatively large area of even well rounded parts of the body. Therefore, the number of irradiations may be kept correspondingly small. The radiation is contained by the extended sidewalls in such a way that it is possible to irradiate fairly large portions of the body which are arranged at a small distance in front of the radiation outlet.

Each extended sidewall preferably has a depth which is at least substantially equal to the maximum width of one of the trough-shaped reflectors.

It is particularly convenient if the extended sidewalls are parallel to one another. This provides convenient access to the free space, and furthermore the rays are reflected at the smallest possible angles.

The distance between the extended sidewalls should be a little bigger then the width of a human face. A useful distance is from 17 to 20 cm. The device can then be used satisfactorily for the irradiation of the face, the arms and the legs.

Preferably, the remaining reflector sidewalls are arranged to be short compared with the width of a reflector so that as much radiation as possible will be transmitted to each extended sidewall from the radiation lamps not adjacent to that sidewall. In this way there results within the free space a relatively large region in which the radiation from all of the lamps overlaps. A particularly high radiation density is therefore achieved. This is of great use for rapid tanning or for successful treatment of psoriasis.

The reflectors may each be in the form of an inner arc, and an outer arc which is joined to the inner arc at an obtuse angle, the inner arcs of adjacent reflectors being joined together at an acute angle, with their convex sides facing each other. Preferably, only two radiation lamps are provided. In this case each reflector at the end of the outer arc remote from the inner arc extends tangentially to the outer arc to form one of the extended sidewalls. Each reflector is thus capable of converting practically all the radiation from its lamp, even the radiation occurring at the back, into useful radiation.

The device can be used standing on its bottom face, e.g., for irradiation of the face, or lying on the rear face or a sideface, e.g., for irradiation of the arm or leg, so that for any kind of treatment the most convenient position of the relevant part of the body results.

It is useful to provide one or more straps in front of the radiation generator so that parts of the body to be irradiated may be placed in the correct position. These straps keep e.g., in the case of medical irradiation, the points on the body attacked by the skin infection, continuously in the region of the maximum density of radiation.

In one example, the reflectors are formed directly by the inner walls of the housing. Such a housing may, for example, be produced by an extrusion method. If the housing consists of metal and thus is heat conductive, radiant heat possibly taken up by the reflector is carried away directly via the outside of the housing to the surrounding air. Preferably, each radiation lamp comprises a mercury vapour fluorescent tube. Also the radiation generator may comprise a maximum of

four radiation lamps.

In another example, a ventilation space is provided between the reflector and the housing which is provided with ventilating slots. Since the development of heat in the case of fluorescent tubes of the preferred kind is very low the requirements for removal of heat are not too high and for this reason the parts of the body to be treated can be brought up very closely against the fluorescent tubes.

Two examples of a device constructed in accordance with the invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of one example and,

Figure 2 is a horizontal section taken through a second example.

The device illustrated in Figure 1 comprises a housing 1 in which two fluorescent tubes 2 and 3 are arranged in parallel side by side, each tube having a low-pressure mercury filling which excites a fluorescent layer 4 (see Figure 2) in such a way that ultraviolet radiation having a maximum intensity in the UVA range is emitted. Each tube 2,3 has a glass shell 5 which filters out the troublesome UVB and UVC radiation. A trough-shaped reflector 6, 7 is associated with each tube 2,3 respectively. Fitted at the bottom of the housing is a cabinet 8 which contains a power supply unit, and a short-time time-switch 9 or a short-time alarm clock with an additional manual switch. The tubes 2,3 are fixed at each end in sockets 10. A ventilation space is formed between the reflectors 6 and 7 and the housing 1 and is connected to the outside through air slots 29.

The housing 1 may stand on any one of three faces, either the bottom face 11 adjoining the ends of the tubes 2,3, or a sideface 12, or a rearface 13. Four feet 14 are fitted to each of these faces, so that the slots 29 remain free for the air to enter.

The device illustrated in Figure 2 comprises a housing 15 of which the inside forms the two reflector troughs 6, 7 directly. For this reason the method of operation of the apparatus shown in Figure 1 may be explained with the aid of Figure 2.

Each reflector trough 6,7 has an inner sidewall 17,16 and an outer sidewall 19,18 respectively. The outer sidewalls 19,18 extend parallel to one another away from the tubes 2,3 to form extensions 21, 20 respectively.

The sidewalls 16,17,18,19 are each wholly or partly in the form of an arc of a circle. Two inner arcs 22 and 23 run together at an acute angle at a central plane of the housing. Two outer arcs 24 and 25 join the inner arcs 22 and 23 respectively at an obtuse angle and continue at their other ends into the extensions 20, 21. The depth *t* of the extensions 20, 21 is a little bigger than the width *w* of each of the reflector troughs 6,7. The distance *a* between the two extensions 20, 21 is a little bigger than the width of a human face, and the remaining sidewalls 16, 17 of the reflector are arranged to be short compared with the width *w* of a reflector 6, 7 so that as much direct radiation from tubes 2,3 as possible will fall on the opposite extensions 20,21 respectively as is indicated by the rays S1 and S2. Thus a space 26 is formed between the extensions 20, 21 and in which direct radiation is present from both fluorescent tubes 2,3.

If now a portion of a person's body, e.g., a face 27, as is shown in dotted line in Figure 2, is brought wholly or partially into the free space 26, this portion is met by direct radiation from both tubes 2,3. Other rays, for example ray S3, are reflected off an extended side wall onto the portion of the body 27. Some of these rays, such as the ray S4, meet the portion of the body 27 relatively far behind, so that the whole curvature of the portion of the body is subjected to a relatively strong radiation. Furthermore, rays emerge from the back of the fluorescent tubes 2, 3, and are first of all reflected at the arcs 22, 23, 24, and 25, and then fall directly, or after further reflection at an extension 20, 21, upon the portion of the body 27.

A strap 28 is illustrated by a dotted line in Figure 1. The strap 28 allows a portion of the body, e.g., an arm, to be arranged in an exactly defined position with respect to the irradiation device. More than one strap 28 may be provided if required. This is of particular interest in the treatment of psoriasis because points attacked may be arranged very accurately in the region of the strongest density of radiation, that is at a predetermined distance from the tubes and substantially on the central plane of the housing.

CLAIMS

1. A device for the ultraviolet irradiation of a person, the device comprising an ultraviolet radiation generator having a plurality of elongate parallel ultraviolet radiation lamps arranged side-by-side; a filter to filter out UVC radiation and at least the shorter wavelength UVB radiation; and a corresponding plurality of trough-shaped reflectors, each of which surrounds a respective one of the lamps, the outermost reflectors each having an outer sidewall which extends forwards beyond the remaining reflector sidewalls to provide a space, free from obstruction, in front of the radiation generator.

2. A device according to claim 1, further comprising a housing which has substantially the shape or a right parallelepiped, the front of which forms a radiation outlet, and wherein the housing may stand on a bottom face, to which one end of each of the lamps is fitted, or on its rear face, or on a sideface.

3. A device according to claim 2, in which a ventilation space is provided between the reflectors and the housing, the space being connected to the outside through ventilating slots in the housing.

4. A device according to claim 2, in which the reflectors are formed directly by the inner wall of the housing.

5. A device according to any one of the

preceding claims, in which the radiation generator comprises two radiation lamps.

6. A device according to any one of the preceding claims, in which the depth of each extended sidewall is at least substantially equal to the maximum width of one of the trough-shaped reflectors.

7. A device according to any one of the preceding claims, in which the reflectors are each in the form of an inner arc, and an outer arc which is joined to the inner arc at an obtuse angle, the inner arcs of adjacent reflectors being joined together at an acute angle, with their convex sides facing each other.

8. A device according to claim 7, when dependant on claim 5, wherein each reflector at the end of the outer arc remote from the inner arc, extends tangentially to the outer arc to form one of the extended sidewalls.

9. A device according to any one of the preceding claims, wherein the extended sidewalls are substantially parallel to one another.

10. A device according to claim 9, in which the distance between the extended sidewalls lies in the range 17 to 20 cm.

11. A device according to any one of the preceding claims, in which the remaining reflector sidewalls are arranged to be short compared with the width of a reflector so that as much radiation as possible will be transmitted directly to each extended sidewall from the radiation lamps not adjacent to that sidewall.

12. A device according to any one of the preceding claims, in which a strap is provided in front of the radiation generator so that parts of the body to be irradiated may be placed in the correct position.

13. A device according to any one of the preceding claims, in which each radiation lamp comprises a mercury vapour fluorescent tube.

14. A device according to claim 13, wherein the filter is formed by a glass shell of each fluorescent tube.

15. A device according to any one of the preceding claims, in which the radiation generator comprises a maximum of four radiation lamps.

16. A device according to claim 1, substantially as described with reference to either of the examples illustrated in the accompanying drawings.

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